Probability & Statistics

Statistics 310 • 3 credit hours • Spring 2015

Instructor:
Genevera Allen (gallen@rice.edu) • DH 2098 • Office Hours: Thursdays 4:30 - 5:30pm.

Teaching Assistants:
Yulia Baker (yulia.baker@rice.edu) • DH 2077 • Office Hours: Tuesdays 2:30-3:30pm
John Nagorski (john.nagorski@rice.edu) • DH 1038 • Office Hours: Wednesdays 10:30 - 11:30am
Please note that ALL course related concerns should be entered through the course website and NOT by emailing the Instructor or TAs.

Time & Location:
Time: Tuesdays & Thursdays 1:00 - 2:15pm. • Location: Keck 100

Course Description: This course is a calculus-based introduction to mathematical probability and statistics. We will cover basic probability, random variables (continuous and discrete), multivariate distributions, the central limit theorem, and statistical inference, including parameter estimation, interval estimation and hypothesis testing.

Course Objectives & Outcomes: Students will learn the basic laws of probability and random variables as well as how probability connects to data through statistics and statistical inference. Students completing this course should be able to: (i) use the basic laws of probability and statistics to solve mathematical problems, (ii) be able able to construct, understand, and correctly interpret statistical inference paradigms including hypothesis tests, confidence intervals, and p-values, and (iii) determine and apply the appropriate probabilistic or statistical concepts in practical applications.

Prerequisites: Calculus. Multi-variable calculus is a plus, but is not required. We will review multi-variable calculus techniques as needed in class. Students should also be familiar with college algebra and set theory.

Recommended Textbooks:
Mathematical Statistics with Applications by Kandethody M. Ramachandran and Chris P. Tsokos, 2009.
Probability and Statistical Inference by Robert V. Hogg, Elliot Tanis, and Dale L. Zimmerman, 9^{th} edition, 2013.

Course Webpage: `https://piazza.com/rice/spring2015/stat310/home`. This is not a typical course website that only lists announcements and assignments. It is also an online interactive forum set up like a Wiki page for students and instructors to post and answer questions and host discussions. Students should pose ALL course related questions and correspondence through this course website and NOT via emails to the instructor or TAs. Students are encouraged to check this website frequently for announcements and to participate and peruse the current discussions. A good strategy is to log onto this website at least once a day. Iphone and other device apps are also available. The features of the course webpage and instructions for posting and answering questions will be reviewed at the beginning of the semester. Additionally, student grades will posted on Owlspace.

Grading Scale: A+ top 6%; A-range next 34%; B-range up to next 45%. Note that this grading scale is uniform across all sections of Stat 310. Precise grades within the A and B range are at the instructor's discretion.

Grading Policy: Final Exam 25%; Midterm Exam 20%; Quizzes 25%; Homeworks 25%; Class Participation 5%. Note that students can earn up to 5% bonus points through supplemental assignments.

Homeworks & Quizzes: There will be 11 homework assignments (weekly) and 9 quizzes (roughly every week) throughout the semester. Homeworks will be assigned on Thursdays and due the next Thursday at 1pm; quizzes will be assigned on Thursdays and due on Tuesdays at 1pm. NO late homeworks or quizzes

will be accepted, NO exceptions. All assignments and quizzes will be completed entirely online through `OpenStaxTutor.org`. The features of this online system will be reviewed at the beginning of the semester. Homeworks can be completed cooperatively, but each student must provide their own write-up that reflects their individual thinking. Quizzes are to be completed individually and are *pledged via the Honor Code*. Additional information on homeworks and quizzes can be found in the separate *Assignments* document and assignment and due dates in the separate *Schedule* document.

Supplemental Assignments: Students can earn up to 5% bonus points (equivalent to dropping the lowest homework and quiz scores) by completing supplemental assignments for a maximum of 110 points. See the separate *Assignments* document for further guidelines and grading policies.

- *Statistics in Practice Essays* (20 points each; up to 3): These are 500-600 word essays reviewing and reflecting upon current news articles related to probability and statistics.
- *Challenge Problems* (10 points each; 9 assigned): Challenge problems will consist of a difficult word problem or proof that will be administered at the end of every quiz. These are to be completed individually and are *pledged via the Honor Code*.
- *Netflix Project & Competition* (60 points): A data science project using Netflix movie rating data and applying the concepts from lectures on joint distributions will be assigned on February 26th and due on April 16th. This will also be a competition (+10 points) to best predict user's movie ratings which in turn can be used to make movie recommendations.
- Additional opportunities to earn points will be announced throughout the semester (e.g. by attending seminars).

Class Attendance, Participation & Clickers: Attendance at lectures is strongly encouraged, but not required. Outlines of each lecture and key concepts will be made available via the course website after each lecture. Students are encouraged to actively participate in lectures by asking questions and answering questions posed. To facilitate participation, we will be using (free) clickers available on computers from `socrative.com` or via `Socrative` apps for IPhones and other devices. To receive full credit for participation (5% of total grade), students will be expected to actively contribute to a positive learning experience by participating on Piazza, answering questions in class, and participating in class clicker exercises.

Exams: There will be one take-home midterm exam and one comprehensive final. All exams will be open book, open notes, and open Wolfram alpha / R (not open Internet!) and *pledged via the Honor Code*. The midterm will be a take-home three hour exam and the comprehensive final will take place during the assigned final exam period for the course.

Example Sessions: Example sessions will be held on Mondays from 5:30 - 6:30pm in Duncan Hall 1044. In this session, concepts will be reviewed from the previous week's lecture and additional example problems will be worked. (Note that homework problems will NOT be among these examples).

Schedule Overview:

Probability	Weeks 1 - 2
Random Variables: Discrete & Continuous	Weeks 3 - 5
Transformations & Joint Distributions	Weeks 6 - 7
Statistics & Sampling Distributions	Weeks 8 - 9
Estimation & Confidence Intervals	Weeks 10 - 12
Inference	Weeks 12 - 14

A more detailed tentative schedule can be found in the separate *Schedule* document.

Students with a documented disability requiring accommodations should speak with both the instructor and Disability Support Services during the first two weeks of class.

This syllabus is subject to change with reasonable advance notice by the instructor.